# TRASANA

TECHNICAL REPORT NO. 3-78

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# FLIGHT PROFILE PERFORMANCE HANDBOOK

## VOLUME II - UH-60A (BLACKHAWK)

JUNE 1978



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DEPARTMENT OF THE ARMY
US ARMY TRADOC SYSTEMS ANALYSIS ACTIVITY
WHITE SANDS MISSILE RANGE
NEW MEXICO 88002

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## VOLUME II - UH-60A (BLACKHAWK)

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**JUNE 1978**

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At AVRADCOM, Mr. Harold Sell, Mr. James O'Malley and Mr. Dale Pitt provided and validated the data in the Handbook. They also assisted in devising the formats to assure clarity in the data presentation and discussion.

At TRASANA, Mr. Frank Gonzalez provided help and guidance during the preparation of the Handbook.

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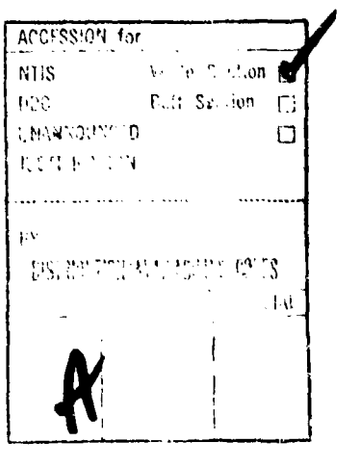

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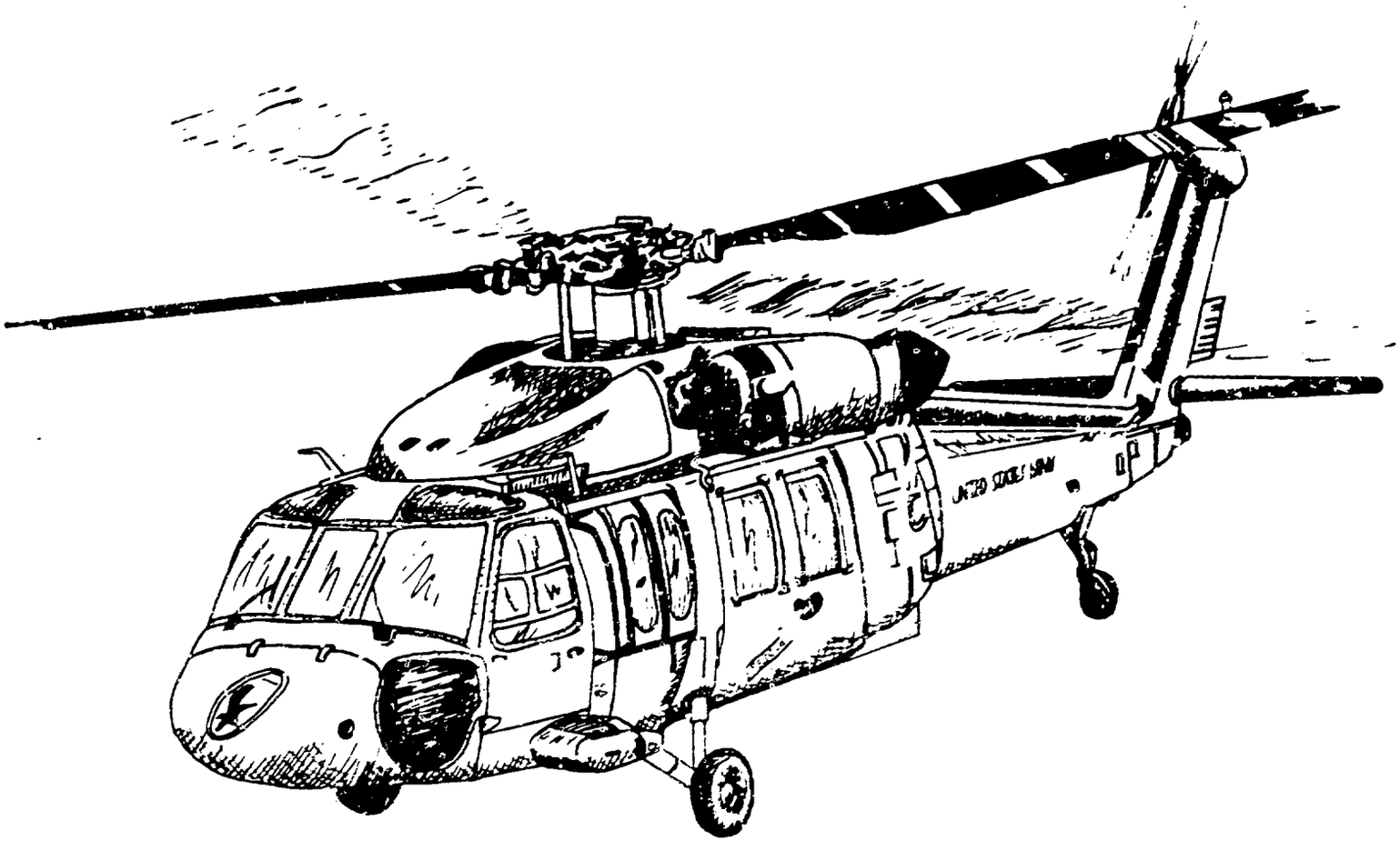
## UH-60A



# CHAPTER 1

# INTRODUCTION

## 1. PURPOSE

The purpose for preparing this handbook series is fourfold: (a) to validate BLACKHAWK performance data quickly, (b) to reduce the manpower and time to prepare accurate flight profiles, (c) to standardize performance data so that the analysis community can benefit from a single reference in conducting studies and (d) to provide a handbook that can be used for training in the mission profile planning area.

## 2. BACKGROUND

The BLACKHAWK performance data contained in this Flight Profile Performance Handbook (FPPH) series was originally acquired as a data base for the Aircraft Mission Processing Simulation (AMPS) model. AMPS is a computer program developed by the Aviation Systems Analysis Branch of the US Army TRADOC Systems Analysis Activity (TRASANA) to support Cost and Operational Effectiveness Analyses (COEAs). AMPS generates detailed flight profiles for a wide variety of helicopter missions. The data was provided TRASANA by the Army Aviation Research and Development Command (AVRADCOM) and was the most accurate data available to AVRADCOM at the time of handbook publication. In structuring the data base for AMPS it was noted that the data, when properly organized, could provide a method of doing quick and simple flight profile simulations. This volume presents the BLACKHAWK data and explains how it can be used.

## 3. OBJECTIVES OF THE HANDBOOK

a. Data Validation. This volume of the handbook contains tables with the precise performance data and format required to develop flight profiles for computer simulations. Using the handbooks as a reference, the individual project manager (PM) will be able to quickly validate or update as required all associated data contained in the different tables. If this procedure is followed by the various PMs, support of Helicopter COEAs and other analyses can be efficiently implemented.

b. Flight Profile Development. Much of the manpower and time spent in preparing flight profiles for supporting aircraft COEAs is dedicated to look-up, correlation and validation of performance data. Once the procedure contained in this handbook is implemented, flight profiles can be easily prepared. What normally took one man 4 to 5 days to prepare can now be prepared in 3 to 4 hours.

c. Standardization of Performance Data. Each of the PMs has been contacted by AVRADCOM to validate the performance data contained in each handbook in this series. Once each handbook is published, the data contained will be kept current as of the publication data. Since the requests for current information are constantly being forwarded to the PMs by analysis groups, this handbook can be a reference and assure a commonality in studies within the community.

d. Training for Planning Missions and Flight Profiles. For training purposes each handbook can stand alone. It is only a matter of following the example provided and applying the proper data to fit the flight profile desired. Although the example shown is simplistic, the methodology may be expanded to apply to any flight profile no matter how complex.

4. OTHER VOLUMES

This handbook is one of a series that covers the helicopters in the US Army inventory. The complete set of handbooks and their subjects are:

Volume I - FPPH Description

Volume II - UH-60A (BLACKHAWK)

Volume III - AH-1G (COBRA)

Volume IV - AH-1S (COBRA)

Volume V - YAH-64 (Advanced Attack Helicopter [AAH])

Volume VI - OH-58C (KIOWA)

Volume VII - CH-47 (CHINOOK)

Volume VIII - CH-54 (TARHE)

Volume IX - UH-1H (HUEY)

5. GENERAL HANDBOOK DESCRIPTION

a. Performance Data. The data contained in these volumes is BLACKHAWK performance data compiled from the results of actual experiments. It is not engineering data and is not intended to serve as a base for future helicopter construction or acquisition. The more mature the helicopter becomes, the less likely there will be a change in the basic performance data.

b. Handbook Organization. This volume is one of a series of volumes as identified in paragraph 4 above. Volume I is a description of the methodology used to develop the tables for each of the other volumes. This volume and all other volumes except Volume I provides a simplified flight profile example in Chapter 2. Chapter 3 provides an explanation of each of the five types of data tables contained in the handbook. The five types of tables deal with: (1) Basic Fuel Flow Data, (2) Delta Fuel Flow for Drag Data, (3) Ground Idle Fuel Flow Data, (4) Gross Weight Limits Data and, (5) Velocity Limits data. Chapter 4 contains the actual tables to be used for developing flight profiles.

# CHAPTER 2

## FLIGHT PROFILE EXAMPLE

### 1. GENERAL

This chapter provides an example of how to develop a flight profile, albeit simple, that can be extended to cover any number of stops, loads and distances all depending on helicopter capability and fuel available.

### 2. DISCUSSION

a. The main question this example of a flight profile will answer is, "Do I have enough fuel to fly the proposed mission?"

b. Suppose a pilot is to fly a simple resupply mission in a UH-60A (BLACKHAWK) helicopter that calls for flying (as shown in illustration 2-1) from point A (the air base), to point B (the pick up area) to point C (the drop off area) and return to A.

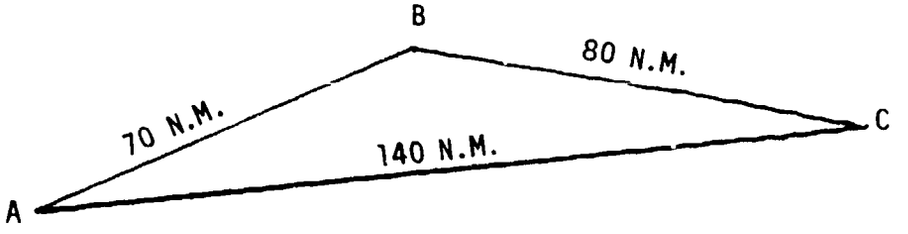



Illustration 2-1

c. The other information given is airspeed (AS) from A to B which is to be 70 knots (kts), from B to C 40 kts, and from C to A 70 kts. The BLACKHAWK helicopter is to be flown, at 4,000 ft for all legs at an ambient temperature of 15°C, and an idle altitude for take off, pick-up and drop off areas (ground level) of 2000 ft*. The mission plan also shows 10 minutes idle at A before take off, 20 minutes idle at B while loading, 20 minutes idle at C while unloading and 10 minutes idle on return to A before shut down. The BLACKHAWK will be flown empty at a gross weight (GW) of 12,000 lbs from A to B and from C to A, while the cargo from B to C will be 6,000 lbs.

---

**All altitudes are in reference to sea level.*

d. The flight plan is prepared by drawing up a table similar to Table 2-1 below. By filling in the blanks under fuel, it can be determined if the total is too large for the helicopter.

TABLE 2-1

Helicopter: BLACKHAWK

Altitude: 4000 ft flight/2000 ft idle

Temperature: 15°C

| LEG | DISTANCE | AS | TIME | GW (lbs) | FUEL |
|---|---|---|---|---|---|
| Idle @ A | - | - | 10 min | - | |
| A-B | 70 N.M. | 70 kts | 1 hr | 12,000 | |
| Idle @ B | - | - | 20 min | - | |
| B-C | 80 N.M. | 40 kts | 2 hr | 18,000 | |
| Idle @ C | - | - | 20 min | - | |
| C-A | 140 N.M. | 70 kts | 2 hr | 12,000 | |
| Idle @ A | - | - | 10 min | - | |

e. First fill in Idle @ A, Idle @ B, Idle @ C and 2nd Idle @ A since they will all come from Table 2-2. In each case the idle is at 2000 ft and a temperature of 15°C. Consulting the ground idle fuel shown in Table 2-2, the value of 509 lbs/hr is at the intersection of 2000 ft and 15°C.

1st Idle @ A = 1/6 X 509 = 85 lbs

Idle @ B = 1/3 X 509 = 170 lbs

Idle @ C = 1/3 X 509 = 170 lbs

2nd Idle @ A = 1/6 X 509 = 85 lbs

TABLE 2-2

GROUND IDLE FUEL FLOW

AIRCRAFT - UH-60A

BLACKHAWK

| | | PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 567 | 529 | 491 | 459 | 426 | 395 |
| | -5 C | 557 | 521 | 484 | 452 | 419 | 388 |
| | 15 C | 549 | 509 | 477 | 446 | 414 | 372 |
| | 35 C | 549 | 510 | 477 | 443 | 409 | 378 |

ENTRIES ARE AIRCRAFT FUEL FLOW RATES IN LBS/HR

TABLE 2-3

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 647 | 765 | 708 | 631 | 594 | 597 | 634 | 706 | 821 | 1067 |
| 14,000 | 713 | 891 | 789 | 687 | 639 | 631 | 666 | 735 | 852 | 1106 |
| 16,000 | 785 | 1006 | 880 | 753 | 690 | 670 | 703 | 771 | 895 | 1164 |
| 18,000 | 865 | 1141 | 987 | 832 | 745 | 718 | 747 | 813 | 946 | 1252 |
| 20,000 | 951 | 1297 | 1111 | 925 | 809 | 774 | 801 | 872 | 1022 | 1407 |

Notice the conversion from minutes to hours. These values must be used because fuel flow is in lbs/hr.

f. The fuel flow for the three legs of the mission are calculated next. The heading on Table 2-1 shows a need for the Basic Fuel Flow data chart for the BLACKHAWK helicopter flying at 4000 ft and at 15°C ambient temperature. Table 2-3 contains the necessary information.

(1) Leg A-B is at 70 kts and 12,000 lbs. This is not one of the values given but 60 kts is 594 lb/hr and 80 kts is 597 lb/hr. Interpolation gives the value of 596 lb/hr for a 70 kts airspeed. Since the leg is one hour long:

Leg A-B = 1 X 596 = 596 lbs

(2) Leg B-C is at 40 kts and 18,000 lbs. This value is in the table; 832 lbs/hr. Since the leg is two hours long:

Leg B-C = 2 X 832 = 1664 lbs

(3) Leg C-A is at 70 kts and 12,000 lbs. This fuel flow rate was computed above to be 596 lbs/hr. Since the leg is two hours long:

Leg C-A = 2 X 596 = 1192 lbs.

g. The flight profile can be finished by filling in Table 2-1 as shown in Table 2-4.

TABLE 2-4

Helicopter: BLACKHAWK
Altitude: 4000 ft flight/2000 ft Idle
Temperature: 15°C

| LEG | DISTANCE | AS | TIME | GW (lbs) | FUEL |
|---|---|---|---|---|---|
| Idle @ A | - | - | 10 min | - | 85 lbs |
| A-B | 70 N.M. | 70 kts | 1 hr | 12,000 | 596 lbs |
| Idle @ B | - | - | 20 min | - | 170 lbs |
| B-C | 80 N.M. | 40 kts | 2 hr | 18,000 | 1664 lbs |
| Idle @ C | - | - | 20 min | - | 170 lbs |
| C-A | 140 N.M. | 70 kts | 2 hr | 12,000 | 1192 lbs |
| Idle @ A | - | - | 10 min | - | 85 lbs |
| | | | | Total | 3962 lbs |

h. Although only two look-up tables were used for this example, each type of table has several conditions that are changed so that a wide band of performance parameters can be addressed. The discussion on each of the five types of tables is contained in Chapter 3. A succinct description of each of these five types of tables is:

(1) Basic Fuel Flow Data: Gives the rate the aircraft uses fuel dependent on the given flight conditions.

(2) Delta Fuel Flow for drag Data: Gives the additional rate of fuel flow to be added to the basic rate for external drag.

(3) Ground Idle Fuel Flow Data: Gives the rate fuel is used when the aircraft is on the ground with its engine running.

(4) Gross Weight Limits Data: A check on whether or not the aircraft has enough lift to take off with a given weight.

(5) Velocity Limits Data gives the optimum (long range) speed and maximum rates of speed.

## CHAPTER 3

## PERFORMANCE DATA TABLE DESCRIPTIONS

### 1. GENERAL

This chapter describes each of the five basic type tables used for developing flight profiles. The variables within each type of table are described as well as how the specific data required can be extracted.

### 2. BASIC FUEL FLOW DATA

a. The basic rate of fuel flow* is determined by five variables:

(1) Type of aircraft

(2) Altitude (Air Pressure)**

(3) Temperature***

(4) Gross Weight****

(5) Flight Mode

b. In each table (see Table 3-1) within the basic type, the first three variables are held constant for the whole table, i.e., (a) Type of Aircraft, (b) Altitude (Air Pressure) above sea level, and (c) Temperature. These variables are stated at the top of each table.

c. There are five rows of fixed gross weights: 12,000 lbs, 14,000 lbs, 16,000 lbs, 18,000 lbs, and 20,000 lbs. The ten columns are fixed flight modes.

(1) The first column is Hover In Ground Effect (HIGE). HIGE is used for hovers at a height of 2 feet or less and a component of forward flight 10 kts or less.

(2) The second column is Hover Out of Ground Effect (HOGE). This is used for hovers at a height of more than 2 feet.

---

*The basic fuel flow data represents a clean drag configuration with all doors closed, no wing stores, and no external sling loads.

**All altitudes or air pressures are feet above sea level.

***For simplicity, all temperatures are considered to be the average temperature in which the helicopter is operating (Degrees Centigrade).

****Total vehicle weight in pounds.

(3) The third column is Nap of the Earth (NOE). This is defined as all flight for variable speeds from 0 to 40 kts and variable altitudes.

(4) The remaining seven columns are for given airspeeds* (in kts) as the flight mode.

d. There are 24 of these basic fuel flow charts. Each chart is for a different combination of Air Pressure (Altitude) and temperature.

e. The Basic Fuel Flow Data is the main table used in simulating a flight profile. For example, assume a pilot's flight path will require 30 minutes of flight at 80 kts airspeed, 4000 ft. altitude, 15°C and a gross weight of 18000 lbs in a UH-60A helicopter. Using Table 3-1 at a gross weight of 18000 lbs and an airspeed of 80 kts, the helicopter will use 718 lbs/hr fuel, i.e., for 30 minutes, 356 lbs of fuel will be used.

f. The gross weights values selected provide the basic range of load carrying capability for the ten flight modes of the BLACKHAWK helicopter. Within the gross weight band shown, linear interpolation** is quite accurate for estimating the fuel flow rates.

g. For example, using Table 3-1, if the helicopter's gross weight was 17,000 lbs and if the flight mode was 60 kts, the fuel flow cannot be found directly. But by interpolating between 60 kts, 16,000 lbs - 690 lbs/hr and 18,000 lbs - 745 lbs/hr, the basic fuel flow rate for 17,000 lbs is 718 lbs/hr. In this example, if the helicopter flies in this mode for 30 minutes, 359 lbs of fuel will be used.

h. As altitude and/or temperature changes occur, different tables are used to look up the aircraft's basic fuel flow rate for each leg of the flight path. Care must be taken that the proper table is used.

i. Appendix A contains a set of functions that will give a good approximation of the basic rate of fuel flow.

3. DELTA FUEL FLOW FOR DRAG DATA

a. The delta fuel flow for drag is also determined by five variables:

(1) Type of Aircraft

(2) Altitude (Air Pressure)

(3) Temperature

(4) Drag Surface (Equivalent Square Footage)

(5) Air Speed

---

*All references to airspeeds are to true airspeeds.*

**All references to interpolation are linear interpolations. See FPPH, Volume I, Chapter 3 for a discussion on the accuracy of interpolation.*

TABLE 3-1

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 647 | 785 | 708 | 631 | 594 | 597 | 634 | 706 | 821 | 1067 |
| 14,000 | 713 | 891 | 789 | 687 | 639 | 631 | 666 | 735 | 852 | 1106 |
| 16,000 | 785 | 1006 | 880 | 753 | 690 | 670 | 703 | 771 | 895 | 1164 |
| 18,000 | 865 | 1141 | 987 | 832 | 745 | 718 | 747 | 813 | 946 | 1252 |
| 20,000 | 951 | 1297 | 1111 | 925 | 809 | 774 | 801 | 872 | 1022 | 1407 |

TABLE 3-2

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 15 | 36 | 73 | 132 | 223 | 394 |
| | 36 | 7 | 22 | 53 | 106 | 192 | 329 | 595 |
| | 54 | 10 | 33 | 80 | 161 | 294 | 518 | 995 |

b. Like the basic fuel flow tables, there are 24 tables for delta fuel flow for drag.

c. There are three fixed rows of equivalent square feet of drag: 25 equivalent sq ft, 36 equivalent sq ft, and 54 equivalent sq ft.

d. The seven columns are for airspeeds in kts of: 40 kts, 60 kts, 80 kts, 100 kts, 120 kts, 140 kts, and 160 kts.

e. When an external load is placed on the helicopter, the amount of fuel consumed per hour increases. The delta fuel flow for drag tables indicate how much extra fuel consumption to add to the basic fuel flow rate.

f. In the example given earlier, a 30 minute flight at 80 kts airspeed, 4000 ft altitude, 15°C and a gross weight of 18,000 lbs was used. Using the basic fuel flow tables, the basic fuel flow rate was 718 lbs/hr. Assuming for this new example that part of the load is external and inducing a 36 equivalent sq ft external drag, the delta fuel flow for drag (Table 3-2) shows 53 lbs/hr should be added to the basic fuel flow rate. Thus the basic fuel flow rate becomes 718 + 53 or 771 lbs per hour and for a half-hour flight, 386 lbs of fuel will be used instead of the 359 lbs figured without an external load.

g. Appendix B contains a function that will give a good approximation of the delta fuel flow for drag.

4. GROUND IDLE FUEL FLOW DATA

a. The ground idle fuel flow rate is determined by only three variables:

(1) Type of Aircraft

(2) Altitude (Air Pressure)

(3) Temperature

b. There is only one ground idle fuel flow table (shown as Table 2-2). The table has four rows of temperatures: -25°C, -5°C, 15°C and 35°C, and six columns of altitudes: Sea Level, 2000 ft, 4000 ft., 6000 ft., 8000 ft., and 10000 ft.

c. The ground idle fuel flow table is used as discussed in the example flight profile in Chapter 2 (Table 2-2). The UH-60A helicopter idling for 20 minutes at 2000 ft. altitude and 15°C, (across the row labeled 15°C and down the column labeled 2000) find the intersection at 509. Thus, the UH-60A uses 509 lbs/hr at these conditions and since it is idling for 20 minutes or 1/3 of an hour, it will use 170 lbs of fuel.

d. If the helicopter had only been 1000 ft. above sea level, the consumption rate would be found by interpolating between the sea level rate of 549 lbs/hr and the 2000 ft. rate of 509 lbs/hr which would be 529 lbs/hr. In 1/3 of an hour 176 lbs of fuel would be used.

e. Appendix C contains a function that will give a good approximation of the ground idle fuel flow.

5. GROSS WEIGHT LIMITS DATA

a. Gross weight limits tables are intended to show whether or not the aircraft can safely take off for four sets of criteria. These criteria are defined in the following paragraphs:

(1) Criteria #1 is based on the helicopter using 100% of Maximum Power for take off and having enough power to lift straight up and above ground effect (See Figure 3-1). Once it is in hovering above ground effect level the helicopter begins forward flight until it acquires, transitional lift and is able to climb at 450 ft/min (a desired standard rate of climb) to the desired altitude. This criteria has some risk since the pilot has no reserve power. It has less risk than Criteria #3 but more than Criteria #2 thus it is considered to be "Middle of the Road" risk.

(2) Criteria #2 (Figure 3-1) is based on the helicopter using 95% of Maximum Power for take off and enough power to immediately begin to climb at a rate of 450 ft/min. This is the least risky criteria since the pilot has power in reserve and is still able to climb at a satisfactory rate.

(3) Criteria #3 (Figure 3-1) has the most risk. Using 100% of Maximum Power the helicopter will only hover in ground effect. Therefore, at an altitude of 2 feet or less, the pilot must begin forward flight and gradually increase airspeed to acquire transitional lift to climb. The reasons for its high risk are readily apparent. First, there is no power in reserve. Second, the pilot must begin forward flight at a very low altitude.

(4) Criteria #4. Structural Gross Weight Limits is the total upper limit of gross weight the helicopter can carry under any take off criteria.

b. Gross Weight Limits are determined by four variables:

(1) Type of Aircraft

(2) Criteria Chosen

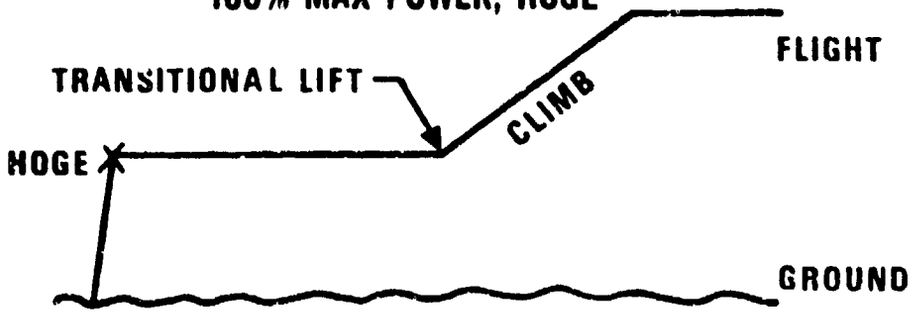
(3) Altitude (Air Pressure)

(4) Temperature

## CRITERIA #1

## (MIDDLE OF THE ROAD)

100% MAX POWER, HOGE




NOTHING TO SPARE.

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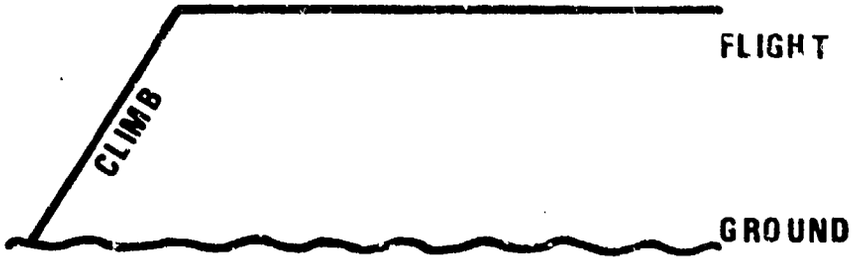
## CRITERIA #2

## (LEAST RISKY)

95% OF RATED POWER. VERTICAL RATE OF CLIMB 450 FT/MIN, HOGE




POWER LEFT

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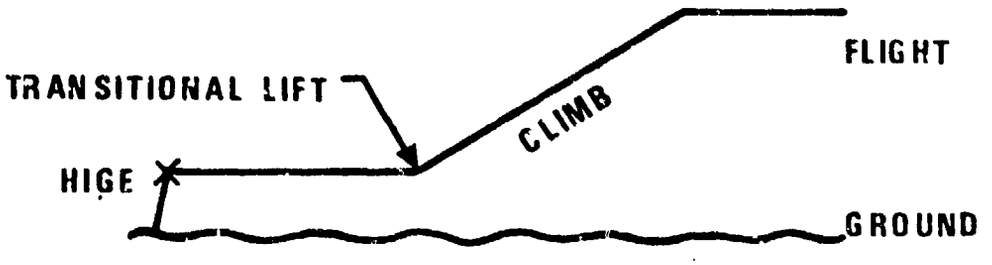
## CRITERIA #3

## (MOST RISKY)

100% MAX POWER, HIGE




NOTHING TO SPARE.

Figure 3-1

c. Additionally, Criteria #1, #2, and #3 differ due to engine power limits or transmission power limits of the aircraft. Thus there are six tables:

(1) Criteria #1 (Due to engine)

(2) Criteria #1 (Due to transmission)

(3) Criteria #2 (Due to engine)

(4) Criteria #2 (Due to transmission)

(5) Criteria #3 (Due to engine)

(6) Criteria #3 (Due to transmission)

d. The structural gross weight limit is a single value for each helicopter and is only dependent on the type helicopter. The BLACKHAWK structural gross weight limit is given as 20,250 lbs and is listed at the bottom of each table. As the name implies, it is simply not safe to expect the UH-60A structure to maneuver normally when the total weight is larger than that value.

e. In simulating inflight profile, the gross weight limits tables are used to check whether the aircraft is going to be too heavy to take off under the given conditions. As an example, assume a BLACKHAWK pilot planned a mission that called for using take off criteria #1 and the take off was to be at 6000 ft., 15°C, and a gross weight of 18,300. Three checks would be required: First, does this gross weight exceed the structural gross weight limit? Second, does it exceed Criteria #1 (due to transmission)? Third, does it exceed Criteria #1 (due to engine)? In the example given, the answer to all three questions is "No", the take off will not exceed aircraft limits. (Tables 3-3 and 3-4)

f. If the assigned gross weight had been 19,000 lbs, it would have exceeded the value given for 6,000 ft. and 15°C at Criteria #1 (Due to engine). (Table 3-3) The mission could not be flown as planned. The plan could be changed, for example to take off at 4000 ft. (which might not be practical) or change to take off Criteria #3 (which is more risky but has higher limits).

g. If the assigned gross weight had been 20,300 lbs., it would have exceeded the structural limits. To perfor the mission the only choices would be to lighten the load or get another type helicopter.

h. Appendix D contains a set of functions that will give a good approximation of the gross weight limits for takeoff.

TABLE 3-3

GROSS WEIGHT LIMITS
(DUE TO ENGINE)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (HOGE)
AIRCRAFT - JH-60A
BLACKHAWK

| | | PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 24815 | 23085 | 21453 | 19922 | 18479 | 17126 |
| | -5 C | 25019 | 23337 | 21717 | 20175 | 18710 | 17265 |
| | 15 C | 22928 | 21357 | 19880 | 18444 | 17061 | 157-1 |
| | 35 C | 20393 | 18979 | 17633 | 16294 | 14990 | 13754 |

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 20,250 LBS

TABLE 3-4

GROSS WEIGHT LIMITS
(DUE TO TRANSMISSION)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (HOGE)
AIRCRAFT - UH-60A
BLACKHAWK

| | | PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 22327 | 21882 | 21440 | 20997 | 20546 | 20094 |
| | -5 C | 21846 | 21413 | 20978 | 20536 | 20092 | 19646 |
| | 15 C | 21417 | 20988 | 20553 | 20116 | 19677 | 19236 |
| | 35 C | 21022 | 20593 | 20161 | 19729 | 19293 | 18857 |

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 20,250 LBS

6. VELOCITY LIMITS DATA

a. There are various types of data given in these tables but like the gross weight limits tables, they are primarily restraints on what can be expected of a helicopter in planning a mission profile. Velocity limits tables are influenced by five variables:

(1) Type of aircraft

(2) Air pressure (altitude)

(3) Temperature

(4) Gross weight

(5) Condition or limit

b. Items (1) through (4) are self-explanatory. There are five types of information that can be listed under (5):

(1) Long range

(2) Maximum continuous power

(3) Maximum power (due to engine limits)

(4) Transmission limits

(5) $V_{ne}$ (velocity never exceed)

c. For each aircraft, there are 24 Velocity Limits Tables depending on air pressure and temperature combination. Table 3-5 is an example of the content of the Velocity Limits Table.

d. The two columns under Long Range (Table 3-5) give the optimum speed and fuel flow for each set of variables #1 through #4 above. Thus the BLACKHAWK helicopter operating at 2000 ft., temperature 15°C, and having a gross weight of 18,000 lbs will fly a longer distance if the velocity is kept at 138 kts and will use 964 lbs/hr of fuel at that velocity.

e. Maximum continuous power gives the fastest speed at which a helicopter can fly for long periods (30 minutes or more) and the associated fuel flow rate. An example from Table 3-3 would be a BLACKHAWK helicopter at 2000 ft. and 15°C weighing 18,000 lbs could fly 154 kts with a fuel usage of 1174 lbs/hr.

TABLE 3-5

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 2000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 140 | 872 | 162 | 1174 | 175 | 1403 | 172 | 1351 |
| 14,000 | 140 | 900 | 160 | 1174 | 173 | 1403 | 171 | 1351 |
| 16,000 | 140 | 935 | 158 | 1174 | 170 | 1403 | 168 | 1351 |
| 18,000 | 138 | 964 | 154 | 1174 | 166 | 1403 | 163 | 1351 |
| 20,000 | 137 | 1007 | 150 | 1174 | 161 | 1403 | 159 | 1351 |

f. Maximum power (engine and transmission limits) show the maximum speeds the aircraft can structurally attain for short periods of time (less than 30 minutes). Thus the BLACKHAWK helicopter at 2000 ft and 15°C weighing 18,000 lbs has an engine that is capable of producing enough power to fly 166 kts but the transmission limits the aircraft to 163 kts. Between these two columns then, the flight cannot exceed 163 kts with a fuel flow rate of 1351 lbs/hr.

g. There is another limiting factor called $V_{ne}$ (velocity never exceed). This velocity limit is determined by helicopter structural considerations. $V_{ne}$'s for the BLACKHAWK are not included in this edition of the FPPH but will be included in later editions when the data is established.

## 7. DETAILED FLIGHT PROFILE USING ALL PERFORMANCE DATA TABLES

The example of a Flight Profile in Chapter 2 was intentionally simplified to assure clarity. The description of the various tables in this handbook, however, indicates a more complex set of considerations are normally encountered in developing the flight profile. With the description provided in this chapter, additional information should be included in the flight plan beyond that shown in the example and a suggested format is provided below in Table 3-4.

TABLE 3-6

Helicopter:
Altitude:
Temperature:

| LEG | DISTANCE | AS | CHECK VELOCITY LIMIT | TIME | GW (LBS) | DRAG | FUEL |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Needed for each take off:
Weight at take off:
Type of take off:
Check transmission limits:
Check engine limits:
Check structural gross weight limit:

# CHAPTER 4

## BLACKHAWK PERFORMANCE DATA TABLES

### GENERAL

The following tables are the major information presented in this handbook. If the procedure for using them is understood, a flight profile for the BLACKHAWK helicopter can be prepared in a matter of a few hours. The performance data contained have been reviewed for accuracy and are corrected to the best of our knowledge. The tables are organized in the following manner:

| | |
|---|---|
| Tables 4-1 to 4-24 | Basic Fuel Flow Data |
| Tables 4-25 to 4-48 | Delta Fuel Flow for Drag Data |
| Table 4-49 | Ground Idle Fuel Flow Data |
| Tables 4-50 to 4-55 | Gross Weight Limits Data |
| Tables 4-56 to 4-79 | Velocity Limits Data |

# BASIC FUEL FLOW DATA

## TABLES

TABLE 4-1

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: SEA LEVEL TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 660 | 777 | 717 | 657 | 631 | 653 | 723 | 845 | 1027 | 1441 |
| 14,000 | 716 | 866 | 784 | 703 | 667 | 683 | 748 | 866 | 1047 | 1480 |
| 16,000 | 776 | 965 | 860 | 754 | 707 | 717 | 778 | 892 | 1080 | 1535 |
| 18,000 | 843 | 1075 | 943 | 811 | 753 | 753 | 813 | 925 | 1127 | 1610 |
| 20,000 | 915 | 1192 | 1034 | 876 | 805 | 793 | 853 | 966 | 1187 | 1709 |

TABLE 4-2

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: SEA LEVEL TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 677 | 798 | 734 | 671 | 641 | 656 | 713 | 816 | 968 | 1296 |
| 14,000 | 734 | 890 | 804 | 718 | 678 | 687 | 739 | 836 | 988 | 1319 |
| 16,000 | 797 | 994 | 882 | 771 | 720 | 720 | 769 | 863 | 1017 | 1361 |
| 18,000 | 866 | 1104 | 968 | 832 | 768 | 756 | 804 | 897 | 1058 | 1423 |
| 20,000 | 941 | 1227 | 1064 | 901 | 822 | 799 | 845 | 936 | 1106 | 1506 |

TABLE 4-3

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: SEA LEVEL TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 694 | 818 | 751 | 684 | 652 | 662 | 710 | 797 | 930 | 1214 |
| 14,000 | 753 | 914 | 824 | 733 | 690 | 693 | 736 | 819 | 952 | 1238 |
| 16,000 | 818 | 1020 | 904 | 789 | 735 | 726 | 767 | 847 | 984 | 1276 |
| 18,000 | 889 | 1133 | 993 | 854 | 785 | 765 | 804 | 883 | 1025 | 1331 |
| 20,000 | 967 | 1262 | 1096 | 929 | 839 | 811 | 846 | 922 | 1071 | 1405 |

TABLE 4-4

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: SEA LEVEL TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 711 | 839 | 768 | 698 | 664 | 670 | 709 | 783 | 896 | 1140 |
| 14,000 | 771 | 938 | 843 | 749 | 704 | 701 | 736 | 804 | 916 | 1161 |
| 16,000 | 839 | 1044 | 926 | 808 | 751 | 735 | 768 | 833 | 943 | 1194 |
| 18,000 | 912 | 1163 | 1020 | 877 | 802 | 776 | 804 | 865 | 985 | 1246 |
| 20,000 | 992 | 1297 | 1127 | 958 | 857 | 824 | 846 | 905 | 1032 | 1325 |

TABLE 4-5

BASIC FUEL FLOW*

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 2000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 637 | 758 | 694 | 630 | 601 | 620 | 682 | 794 | 962 | 1355 |
| 14,000 | 695 | 853 | 765 | 678 | 639 | 651 | 710 | 817 | 988 | 1401 |
| 16,000 | 759 | 958 | 845 | 732 | 683 | 686 | 742 | 847 | 1029 | 1467 |
| 18,000 | 829 | 1072 | 933 | 795 | 733 | 725 | 780 | 885 | 1085 | 1557 |
| 20,000 | 905 | 1201 | 1034 | 866 | 788 | 770 | 824 | 929 | 1153 | 1677 |

TABLE 4-6

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 2000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 653 | 779 | 711 | 643 | 611 | 623 | 673 | 766 | 907 | 1213 |
| 14,000 | 713 | 878 | 785 | 693 | 650 | 654 | 701 | 790 | 932 | 1244 |
| 16,000 | 779 | 985 | 868 | 750 | 696 | 689 | 734 | 821 | 968 | 1298 |
| 18,000 | 852 | 1102 | 959 | 816 | 748 | 729 | 773 | 859 | 1014 | 1373 |
| 20,000 | 931 | 1239 | 1066 | 893 | 803 | 777 | 817 | 901 | 1067 | 1473 |

TABLE 4-7

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 2000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 669 | 800 | 728 | 656 | 622 | 628 | 670 | 750 | 873 | 1137 |
| 14,000 | 731 | 901 | 805 | 708 | 663 | 660 | 699 | 774 | 899 | 1168 |
| 16,000 | 800 | 1010 | 890 | 769 | 711 | 696 | 733 | 807 | 937 | 1215 |
| 18,000 | 875 | 1133 | 987 | 840 | 764 | 739 | 773 | 845 | 982 | 1281 |
| 20,000 | 957 | 1275 | 1099 | 923 | 820 | 790 | 820 | 891 | 1039 | 1388 |

TABLE 4-8

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 2000 FT TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 686 | 820 | 745 | 669 | 633 | 635 | 670 | 736 | 840 | 1067 |
| 14,000 | 750 | 924 | 824 | 724 | 677 | 668 | 699 | 761 | 866 | 1095 |
| 16,000 | 821 | 1036 | 913 | 789 | 727 | 705 | 734 | 792 | 902 | 1139 |
| 18,000 | 898 | 1165 | 1015 | 866 | 780 | 751 | 774 | 828 | 943 | 1203 |
| 20,000 | 983 | 1310 | 1132 | 955 | 840 | 803 | 823 | 881 | 1008 | 1321 |

TABLE 4-9

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 616 | 743 | 674 | 605 | 574 | 589 | 645 | 746 | 903 | 1276 |
| 14,000 | 676 | 843 | 750 | 656 | 615 | 622 | 675 | 773 | 936 | 1332 |
| 16,000 | 744 | 954 | 834 | 715 | 662 | 659 | 710 | 808 | 986 | 1411 |
| 18,000 | 818 | 1076 | 930 | 783 | 716 | 701 | 752 | 850 | 1050 | 1520 |
| 20,000 | 899 | 1222 | 1042 | 862 | 773 | 752 | 800 | 901 | 1125 | 1669 |

TABLE 4-10

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 631 | 764 | 691 | 618 | 584 | 592 | 636 | 721 | 852 | 1138 |
| 14,000 | 694 | 868 | 770 | 671 | 626 | 625 | 667 | 748 | 882 | 1180 |
| 16,000 | 765 | 980 | 857 | 733 | 675 | 662 | 704 | 783 | 924 | 1246 |
| 18,000 | 842 | 1109 | 958 | 806 | 730 | 707 | 746 | 824 | 974 | 1336 |
| 20,000 | 925 | 1260 | 1076 | 892 | 788 | 760 | 795 | 874 | 1043 | 1472 |

TABLE 4-11

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 647 | 785 | 708 | 631 | 594 | 597 | 634 | 706 | 821 | 1067 |
| 14,000 | 713 | 891 | 789 | 687 | 639 | 631 | 666 | 735 | 852 | 1106 |
| 16,000 | 785 | 1006 | 880 | 753 | 690 | 670 | 703 | 771 | 895 | 1164 |
| 18,000 | 865 | 1141 | 987 | 832 | 745 | 718 | 747 | 813 | 946 | 1252 |
| 20,000 | 951 | 1297 | 1111 | 925 | 809 | 774 | 801 | 872 | 1022 | 1407 |

TABLE 4-12

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 4000 FT TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHT (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 663 | 805 | 725 | 644 | 606 | 604 | 634 | 694 | 790 | 1001 |
| 14,000 | 731 | 912 | 808 | 704 | 653 | 638 | 666 | 722 | 822 | 1037 |
| 16,000 | 806 | 1034 | 905 | 775 | 705 | 680 | 704 | 755 | 860 | 1090 |
| 18,000 | 888 | 1173 | 1016 | 860 | 761 | 730 | 749 | 801 | 915 | 1187 |
| 20,000 | 977 | 1333 | 1147 | 961 | 837 | 792 | 807 | 968 | 992 | 1338 |

TABLE 4-13

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 6000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 597 | 732 | 657 | 583 | 549 | 560 | 611 | 703 | 849 | 1205 |
| 14,000 | 661 | 837 | 737 | 637 | 593 | 595 | 643 | 734 | 892 | 1272 |
| 16,000 | 732 | 954 | 828 | 701 | 645 | 635 | 682 | 773 | 950 | 1368 |
| 18,000 | 811 | 1091 | 934 | 776 | 701 | 683 | 728 | 821 | 1021 | 1501 |
| 20,000 | 897 | 1252 | 1058 | 865 | 762 | 739 | 781 | 882 | 1114 | 1709 |

TABLE 4-14

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 6000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 612 | 753 | 674 | 595 | 559 | 563 | 603 | 680 | 802 | 1071 |
| 14,000 | 679 | 861 | 757 | 653 | 605 | 598 | 636 | 711 | 838 | 1126 |
| 16,000 | 753 | 981 | 851 | 721 | 658 | 639 | 677 | 750 | 886 | 1205 |
| 18,000 | 835 | 1125 | 964 | 802 | 714 | 690 | 723 | 795 | 945 | 1321 |
| 20,000 | 924 | 1291 | 1095 | 898 | 781 | 749 | 780 | 860 | 1040 | 1516 |

TABLE 4-15

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 6000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 628 | 773 | 691 | 608 | 570 | 568 | 601 | 666 | 774 | 1005 |
| 14,000 | 697 | 883 | 776 | 670 | 618 | 604 | 636 | 699 | 812 | 1053 |
| 16,000 | 774 | 1010 | 876 | 743 | 671 | 649 | 677 | 738 | 858 | 1124 |
| 18,000 | 858 | 1158 | 994 | 831 | 731 | 702 | 727 | 790 | 925 | 1256 |
| 20,000 | 950 | 1329 | 1133 | 936 | 811 | 769 | 792 | 867 | 1016 | 1452 |

TABLE 4-16

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 6000 ' TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| GR WEI. (LB | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 644 | 792 | 707 | 622 | 582 | 574 | 601 | 655 | 746 | 942 |
| 14,000 | 715 | 906 | 797 | 688 | 632 | 612 | 636 | 686 | 781 | 987 |
| 16,000 | 794 | 1037 | 902 | 766 | 686 | 659 | 678 | 725 | 826 | 1060 |
| 18,000 | 881 | 1190 | 1026 | 861 | 753 | 716 | 731 | 785 | 898 | 1196 |
| 20,000 | 976 | 1366 | 1176 | 986 | 854 | 799 | 807 | 871 | 995 | 1397 |

TABLE 4-17

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 8000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 580 | 723 | 643 | 563 | 528 | 534 | 580 | 664 | 804 | 1144 |
| 14,000 | 648 | 834 | 728 | 622 | 575 | 571 | 615 | 699 | 855 | 1225 |
| 16,000 | 724 | 961 | 827 | 693 | 630 | 615 | 659 | 743 | 921 | 1341 |
| 18,000 | 808 | 1115 | 946 | 776 | 689 | 669 | 709 | 799 | 1004 | 1517 |
| 20,000 | 901 | 1293 | 1085 | 877 | 758 | 730 | 771 | 880 | 1128 | 1793 |

TABLE 4-18

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 8000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 596 | 744 | 660 | 576 | 537 | 536 | 573 | 643 | 758 | 1014 |
| 14,000 | 666 | 857 | 748 | 639 | 587 | 574 | 610 | 678 | 801 | 1081 |
| 16,000 | 745 | 991 | 853 | 715 | 642 | 621 | 653 | 720 | 853 | 1178 |
| 18,000 | 831 | 1150 | 978 | 805 | 704 | 677 | 706 | 778 | 935 | 1344 |
| 20,000 | 928 | 1334 | 1125 | 916 | 788 | 748 | 775 | 861 | 1049 | 1608 |

TABLE 4-19

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HP

PRESSURE: 8000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 611 | 764 | 677 | 590 | 549 | 542 | 572 | 631 | 732 | 950 |
| 14,000 | 684 | 881 | 769 | 657 | 600 | 582 | 610 | 667 | 775 | 1009 |
| 16,000 | 766 | 1020 | 879 | 738 | 656 | 632 | 655 | 712 | 830 | 1110 |
| 18,000 | 855 | 1184 | 1010 | 837 | 727 | 693 | 715 | 780 | 916 | 1289 |
| 20,000 | 954 | 1373 | 1173 | 972 | 837 | 783 | 800 | 880 | 1037 | 1571 |

TABLE 4-20

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 8000 FT TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 627 | 782 | 693 | 604 | 561 | 548 | 572 | 620 | 706 | 891 |
| 14,000 | 702 | 905 | 791 | 676 | 612 | 591 | 610 | 654 | 745 | 946 |
| 16,000 | 786 | 1048 | 906 | 764 | 672 | 642 | 658 | 704 | 806 | 1057 |
| 18,000 | 878 | 1217 | 1046 | 875 | 760 | 714 | 724 | 781 | 890 | 1228 |
| 20,000 | 981 | 1412 | 1233 | 1053 | 900 | 831 | 831 | 901 | 1053 | 1585 |

TABLE 4-21

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 10000 FT  TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 567 | 718 | 632 | 547 | 509 | 510 | 552 | 629 | 765 | 1091 |
| 14,000 | 639 | 835 | 723 | 611 | 561 | 551 | 591 | 669 | 825 | 1190 |
| 16,000 | 719 | 979 | 834 | 689 | 618 | 601 | 639 | 719 | 899 | 1336 |
| 18,000 | 809 | 1149 | 966 | 784 | 683 | 659 | 696 | 791 | 1009 | 1583 |
| 20,000 | 911 | 1358 | 1130 | 903 | 771 | 734 | 771 | 895 | 1158 | 1902 |

TABLE 4-22

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 10000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 582 | 738 | 649 | 560 | 519 | 513 | 546 | 610 | 719 | 965 |
| 14,000 | 657 | 860 | 745 | 629 | 572 | 555 | 587 | 649 | 767 | 1047 |
| 16,000 | 740 | 1009 | 861 | 714 | 630 | 607 | 635 | 698 | 834 | 1178 |
| 18,000 | 833 | 1185 | 1001 | 817 | 705 | 672 | 698 | 773 | 940 | 1411 |
| 20,000 | 939 | 1400 | 1182 | 964 | 822 | 769 | 790 | 885 | 1094 | 1774 |

TABLE 4-23

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 10000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 598 | 757 | 665 | 574 | 530 | 518 | 546 | 600 | 696 | 903 |
| 14,000 | 675 | 885 | 767 | 649 | 584 | 563 | 587 | 639 | 743 | 978 |
| 16,000 | 761 | 1039 | 889 | 740 | 647 | 619 | 640 | 697 | 817 | 1128 |
| 18,000 | 857 | 1220 | 1039 | 859 | 741 | 697 | 715 | 765 | 920 | 1358 |
| 20,000 | 966 | 1440 | 1249 | 1058 | 894 | 826 | 834 | 926 | 1131 | 1858 |

TABLE 4-24

BASIC FUEL FLOW

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR

PRESSURE: 10000 FT TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | FLIGHT MODE (KTS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | HIGE | HOGE | NOE | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 12,000 | 613 | 776 | 683 | 589 | 542 | 525 | 546 | 589 | 670 | 846 |
| 14,000 | 693 | 909 | 790 | 670 | 596 | 573 | 588 | 629 | 717 | 925 |
| 16,000 | 781 | 1066 | 919 | 769 | 670 | 634 | 645 | 694 | 793 | 1072 |
| 18,000 | 880 | 1254 | 1087 | 921 | 792 | 734 | 737 | 798 | 921 | 1345 |
| 20,000 | 993 | 1480 | 1314 | 1148 | 962 | 876 | 866 | 946 | 1145 | 1873 |

DELTA FUEL FLOW FOR DRAG DATA

TABLES

TABLE 4-25

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: SEA LEVEL TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 6 | 21 | 49 | 101 | 184 | 326 | 650 |
| | 36 | 9 | 30 | 71 | 146 | 269 | 489 | 986 |
| | 54 | 13 | 45 | 108 | 222 | 417 | 783 | 1530 |

TABLE 4-26

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: SEA LEVEL  TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 150 |
| DRAG IN SQUARE FEET | 25 | 6 | 19 | 45 | 91 | 167 | 285 | 523 |
| | 36 | 8 | 27 | 65 | 133 | 243 | 424 | 809 |
| | 54 | 12 | 41 | 99 | 202 | 372 | 673 | 1318 |

TABLE 4-27

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: SEA LEVEL TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 17 | 42 | 84 | 152 | 256 | 452 |
| | 36 | 8 | 25 | 60 | 122 | 221 | 377 | 681 |
| | 54 | 11 | 38 | 91 | 185 | 338 | 594 | 1136 |

TABLE 4-28

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: SEA LEVEL TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 16 | 39 | 77 | 139 | 233 | 394 |
| | 36 | 7 | 23 | 56 | 112 | 203 | 342 | 593 |
| | 54 | 11 | 35 | 85 | 170 | 310 | 532 | 957 |

TABLE 4-29

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 2000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 6 | 19 | 46 | 94 | 172 | 305 | 611 |
| | 36 | 8 | 28 | 67 | 136 | 251 | 447 | 922 |
| | 54 | 12 | 42 | 101 | 208 | 390 | 732 | 1428 |

TABLE 4-30

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 2000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 18 | 42 | 85 | 155 | 266 | 488 |
| | 36 | 8 | 25 | 61 | 124 | 226 | 396 | 757 |
| | 54 | 11 | 38 | 92 | 188 | 347 | 628 | 1229 |

TABLE 4-31

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 2000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 16 | 39 | 78 | 142 | 239 | 422 |
| | 36 | 7 | 24 | 56 | 114 | 206 | 362 | 636 |
| | 54 | 11 | 35 | 85 | 173 | 315 | 555 | 1063 |

TABLE 4-32

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 2000 FT TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 15 | 34 | 72 | 130 | 218 | 368 |
| | 36 | 7 | 22 | 52 | 105 | 189 | 319 | 553 |
| | 54 | 10 | 33 | 79 | 159 | 289 | 496 | 894 |

TABLE 4-33

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 18 | 43 | 88 | 160 | 285 | 575 |
| | 36 | 8 | 26 | 63 | 127 | 234 | 427 | 862 |
| | 54 | 12 | 39 | 95 | 194 | 364 | 664 | 1332 |

TABLE 4-34

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 17 | 40 | 80 | 145 | 248 | 457 |
| | 36 | 7 | 24 | 57 | 116 | 211 | 370 | 709 |
| | 54 | 11 | 36 | 86 | 176 | 324 | 586 | 1147 |

TABLE 4-35

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 15 | 36 | 73 | 132 | 223 | 394 |
| | 36 | 7 | 22 | 53 | 106 | 192 | 329 | 595 |
| | 54 | 10 | 33 | 80 | 161 | 294 | 518 | 995 |

TABLE 4-36

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 4000 FT TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 4 | 14 | 34 | 68 | 121 | 203 | 344 |
| | 36 | 6 | 21 | 49 | 98 | 177 | 297 | 517 |
| | 54 | 9 | 31 | 74 | 149 | 269 | 463 | 636 |

TABLE 4-37

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 6000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 17 | 40 | 82 | 149 | 266 | 543 |
| | 36 | 7 | 24 | 58 | 119 | 219 | 399 | 807 |
| | 54 | 11 | 37 | 88 | 181 | 340 | 640 | 1293 |

TABLE 4-38

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 6000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 15 | 37 | 74 | 135 | 232 | 428 |
| | 36 | 7 | 22 | 53 | 108 | 197 | 345 | 666 |
| | 54 | 10 | 34 | 81 | 164 | 302 | 548 | 1072 |

TABLE 4-39

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 6000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 4 | 14 | 34 | 68 | 123 | 208 | 369 |
| | 36 | 6 | 21 | 49 | 99 | 179 | 307 | 557 |
| | 54 | 9 | 31 | 74 | 150 | 274 | 484 | 934 |

TABLE 4-40

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 6000 FT TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 4 | 13 | 32 | 63 | 113 | 189 | 322 |
| | 36 | 6 | 19 | 46 | 92 | 165 | 277 | 483 |
| | 54 | 9 | 29 | 69 | 139 | 251 | 432 | 784 |

TABLE 4-41

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 8000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 5 | 16 | 38 | 76 | 139 | 250 | 514 |
| | 36 | 7 | 23 | 55 | 111 | 204 | 375 | 757 |
| | 54 | 10 | 34 | 83 | 169 | 317 | 603 | 1161 |

TABLE 4-42

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 8000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 4 | 14 | 35 | 70 | 126 | 217 | 403 |
| | 36 | 6 | 21 | 50 | 101 | 183 | 323 | 628 |
| | 54 | 9 | 31 | 75 | 153 | 282 | 513 | 1003 |

TABLE 4-43

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 8000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 4 | 13 | 32 | 64 | 115 | 194 | 346 |
| | 36 | 6 | 19 | 46 | 93 | 167 | 287 | 524 |
| | 54 | 9 | 29 | 70 | 140 | 256 | 453 | 879 |

TABLE 4-44

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 6000 FT TEMPERATURE: 35 C

AIRCRAFT · UH-60A
BLA[illegible]K

| DRAG IN SQUARE FEET | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|
| | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 25 | 4 | 12 | 30 | 59 | 104 | 176 | 302 |
| 36 | 5 | 18 | 43 | 83 | 154 | 259 | 453 |
| 54 | 8 | 27 | 64 | 130 | 234 | 404 | 737 |

TABLE 4-45

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 10000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 4 | 15 | 35 | 71 | 130 | 236 | 490 |
| | 36 | 6 | 21 | 51 | 104 | 191 | 352 | 710 |
| | 54 | 10 | 32 | 77 | 157 | 297 | 570 | 1084 |

TABLE 4-46

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 10000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| DRAG IN SQUARE FEET | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|
| | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| 25 | 4 | 14 | 32 | 65 | 117 | 203 | 381 |
| 36 | 6 | 20 | 47 | 94 | 171 | 303 | 596 |
| 54 | 9 | 30 | 71 | 143 | 263 | 481 | 940 |

TABLE 4-47

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 10000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 4 | 13 | 30 | 60 | 107 | 182 | 326 |
| | 36 | 6 | 18 | 43 | 86 | 156 | 269 | 495 |
| | 54 | 8 | 27 | 65 | 131 | 239 | 425 | 819 |

TABLE 4-48

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG

PRESSURE: 10000 FT TEMPERATURE: 35 C

AIRCRAFT - UH-60A
BLACKHAWK

| | | AIR SPEED IN KTS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| DRAG IN SQUARE FEET | 25 | 4 | 12 | 28 | 55 | 99 | 165 | 284 |
| | 36 | 5 | 17 | 40 | 80 | 143 | 242 | 426 |
| | 54 | 8 | 25 | 60 | 121 | 218 | 379 | 696 |

GROUND IDLE FUEL FLOW DATA

TABLE

TABLE 4-49

GROUND IDLE FUEL FLOW

AIRCRAFT - UH-60A

BLACKHAWK

| | | PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 567 | 529 | 491 | 459 | 426 | 395 |
| | -5 C | 557 | 521 | 484 | 452 | 419 | 388 |
| | 15 C | 549 | 509 | 477 | 446 | 414 | 372 |
| | 35 C | 549 | 510 | 477 | 443 | 409 | 378 |

ENTRIES ARE AIRCRAFT FUEL FLOW RATES IN LBS/HR

GROSS WEIGHT LIMITS DATA

TABLES

TABLE 4-50

GROSS WEIGHT LIMITS
(DUE TO ENGINE)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (HOGE)
AIRCRAFT - UH-60A
BLACKHAWK

| | | PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 24815 | 23085 | 21453 | 19922 | 18479 | 17126 |
| | -5 C | 25019 | 23337 | 21717 | 20175 | 18710 | 17265 |
| | 15 C | 22928 | 21357 | 19880 | 18444 | 17061 | 15741 |
| | 35 C | 20393 | 18979 | 17633 | 16294 | 14990 | 13754 |

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 20,250 LBS

TABLE 4-51

GROSS WEIGHT LIMITS
(DUE TO TRANSMISSION)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (HOGE)
AIRCRAFT - UH-60A
BLACKHAWK

| | | PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 22327 | 21882 | 21440 | 20997 | 20546 | 20094 |
| | -5 C | 21846 | 21413 | 20978 | 20536 | 20092 | 19646 |
| | 15 C | 21417 | 20988 | 20553 | 20116 | 19677 | 19236 |
| | 35 C | 21022 | 20593 | 20161 | 19729 | 19293 | 18857 |

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 20,250 LBS

TABLE 4-52

GROSS WEIGHT LIMITS
(DUE TO ENGINE)
FOR TAKEOFF CRITERIA #2
95% OF RATED POWER. VERTICAL RATE OF CLIMB 450 FT/MIN. OGE
AIRCRAFT - UH-60A
BLACKHAWK

| | | PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 23354 | 21726 | 20190 | 18749 | 17391 | 16118 |
| | -5 C | 23573 | 21990 | 20464 | 19012 | 17631 | 16269 |
| | 15 C | 21596 | 20117 | 18727 | 17374 | 16070 | 14827 |
| | 35 C | 19194 | 17862 | 16596 | 15336 | 14107 | 12942 |

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 20,250 LBS

TABLE 4-53

GROSS WEIGHT LIMITS

(DUE TO TRANSMISSION)

FOR TAKEOFF CRITERIA #2

TRANSMISSION POWER LIMIT. VERTICAL RATE OF CLIMB 450 FT/MIN. OGE

AIRCRAFT - UH-60A

BLACKHAWK

| | | PRESSURE ALTIT E (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 21788 | 21370 | 20948 | 20528 | 20101 | 19669 |
| | -5 C | 21335 | 20921 | 20509 | 20090 | 19666 | 19241 |
| | 15 C | 20925 | 20519 | 20106 | 19689 | 19271 | 18849 |
| | 35 C | 20550 | 20144 | 19732 | 19320 | 18904 | 18486 |

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 20,250 LBS

TABLE 4-54

GROSS WEIGHT LIMITS
(DUE TO ENGINE)
FOR TAKEOFF CRITERIA #3
100% OF MAXIMUM POWER (HIGE)
AIRCRAFT - UH-60A
BLACKHAWK

| | | PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 32867 | 0575 | 28413 | 26385 | 24475 | 22683 |
| | -5 C | 33143 | 30916 | 28770 | 26728 | 24786 | 22873 |
| | 15 C | 30374 | 28292 | 26336 | 24434 | 22601 | 20854 |
| | 35 C | 27018 | 25144 | 23361 | 21588 | 19860 | 18222 |

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 20,250 LBS

TABLE 4-55

GROSS WEIGHT LIMITS
(DUE TO TRANSMISSION)
FOR TAKEOFF CRITERIA #3
100% OF MAXIMUM POWER (HIGE)
AIRCRAFT - UH-60A
BLACKHAWK

| | | PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|---|
| | | SEA LEVEL | 2000 | 4000 | 6000 | 8000 | 10000 |
| TEMPERATURE DEGREES CENTIGRADE | -25 C | 29552 | 28978 | 28397 | 27810 | 27218 | 26623 |
| | -5 C | 28941 | 28368 | 27789 | 27207 | 26620 | 26029 |
| | 15 C | 28375 | 27805 | 27230 | 26651 | 26069 | 25484 |
| | 35 C | 27849 | 27282 | 26711 | 26137 | 25560 | 24981 |

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 20,250 LBS

VELOCITY LIMITS DATA

TABLES

TABLE 4-56

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: SEA LEVEL TEMPERATURE: -25 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 130 | 926 | 167 | 1629 | 164 | 1574 | 157 | 1351 |
| 14,000 | 131 | 957 | 165 | 1629 | 163 | 1574 | 156 | 1351 |
| 16,000 | 132 | 991 | 163 | 1629 | 161 | 1574 | 154 | 1351 |
| 18,000 | 132 | 1028 | 161 | 1629 | 159 | 1574 | 151 | 1351 |
| 20,000 | 131 | 1061 | 158 | 1629 | 156 | 1574 | 148 | 1351 |

TABLE 4-57

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: SEA LEVEL TEMPERATURE: -5 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 135 | 927 | 168 | 1464 | 175 | 1640 | 163 | 1357 |
| 14,000 | 136 | 951 | 167 | 1464 | 174 | 1640 | 162 | 1357 |
| 16,000 | 136 | 978 | 164 | 1464 | 172 | 1640 | 160 | 1357 |
| 18,000 | 135 | 1013 | 162 | 1464 | 169 | 1640 | 157 | 1357 |
| 20,000 | 135 | 1054 | 159 | 1464 | 165 | 1640 | 154 | 1357 |

TABLE 4-58

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: SEA LEVEL TEMPERATURE: 15 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 139 | 924 | 162 | 1263 | 176 | 1504 | 168 | 1364 |
| 14,000 | 140 | 952 | 161 | 1263 | 174 | 1504 | 167 | 1364 |
| 16,000 | 140 | 982 | 159 | 1263 | 172 | 1504 | 164 | 1364 |
| 18,000 | 139 | 1018 | 157 | 1263 | 169 | 1504 | 162 | 1364 |
| 20,000 | 139 | 1049 | 153 | 1263 | 164 | 1504 | 158 | 1364 |

TABLE 4-59

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: SEA LEVEL TEMPERATURE: 35 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 143 | 921 | 157 | 1092 | 173 | 1345 | 175 | 1371 |
| 14,000 | 143 | 945 | 156 | 1092 | 172 | 1345 | 174 | 1371 |
| 16,000 | 143 | 978 | 153 | 1092 | 170 | 1345 | 171 | 1371 |
| 18,000 | 143 | 1012 | 150 | 1092 | 166 | 1345 | 168 | 1371 |
| 20,000 | 142 | 1052 | 145 | 1092 | 161 | 1345 | 162 | 1371 |

TABLE 4-60

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 2000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 131 | 873 | 166 | 1514 | 164 | 1466 | 160 | 1343 |
| 14,000 | 132 | 906 | 164 | 1514 | 162 | 1466 | 158 | 1343 |
| 16,000 | 132 | 941 | 161 | 1514 | 160 | 1466 | 156 | 1343 |
| 18,000 | 131 | 976 | 159 | 1514 | 157 | 1466 | 153 | 1343 |
| 20,000 | 128 | 1002 | 155 | 1514 | 154 | 1466 | 149 | 1343 |

TABLE 4-61

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 2000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 136 | 871 | 167 | 1360 | 175 | 1533 | 167 | 1347 |
| 14,000 | 136 | 895 | 166 | 1360 | 174 | 1533 | 165 | 1347 |
| 16,000 | 135 | 928 | 162 | 1360 | 170 | 1533 | 162 | 1347 |
| 18,000 | 135 | 968 | 159 | 1360 | 167 | 1533 | 159 | 1347 |
| 20,000 | 134 | 1009 | 156 | 1360 | 162 | 1533 | 155 | 1347 |

TABLE 4-62

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 2000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 140 | 872 | 162 | 1179 | 175 | 1403 | 172 | 1351 |
| 14,000 | 140 | 900 | 160 | 1179 | 173 | 1403 | 171 | 1351 |
| 16,000 | 140 | 935 | 158 | 1179 | 170 | 1403 | 168 | 1351 |
| 18,000 | 138 | 969 | 154 | 1179 | 166 | 1403 | 163 | 1351 |
| 20,000 | 137 | 1007 | 150 | 1179 | 161 | 1403 | 159 | 1351 |

TABLE 4-63

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 2000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 143 | 866 | 156 | 1014 | 173 | 1253 | 180 | 1357 |
| 14,000 | 143 | 894 | 154 | 1014 | 171 | 1253 | 178 | 1357 |
| 16,000 | 143 | 928 | 151 | 1014 | 168 | 1253 | 175 | 1357 |
| 18,000 | 142 | 965 | 147 | 1014 | 163 | 1253 | 169 | 1357 |
| 20,000 | 141 | 1019 | 141 | 1014 | 157 | 1253 | 162 | 1357 |

TABLE 4-64

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 4000 FT TEMPERATURE: -5 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 131 | 825 | 165 | 1405 | 163 | 1364 | 162 | 1340 |
| 14,000 | 132 | 859 | 162 | 1405 | 161 | 1364 | 160 | 1340 |
| 16,000 | 132 | 897 | 160 | 1405 | 158 | 1364 | 158 | 1340 |
| 18,000 | 130 | 929 | 156 | 1405 | 155 | 1364 | 154 | 1340 |
| 20,000 | 127 | 964 | 152 | 1405 | 151 | 1364 | 150 | 1340 |

TABLE 4-65

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 4000 FT TEMPERATURE: -6 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 136 | 820 | 167 | 1263 | 175 | 1429 | 171 | 1341 |
| 14,000 | 136 | 847 | 164 | 1263 | 17[illegible] | 1429 | 168 | 1341 |
| 16,000 | 135 | 884 | 161 | 1263 | 169 | 1429 | 164 | 1341 |
| 18,000 | 135 | 926 | 157 | 1263 | 164 | 1429 | 160 | 1341 |
| 20,000 | 133 | 973 | 152 | 1263 | 159 | 1429 | 155 | 1341 |

TABLE 4-66

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 140 | 821 | 161 | 1089 | 175 | 1309 | 177 | 1343 |
| 14,000 | 140 | 854 | 159 | 1089 | 172 | 1309 | 174 | 1343 |
| 16,000 | 139 | 887 | 156 | 1089 | 168 | 1309 | 170 | 1343 |
| 18,000 | 137 | 921 | 151 | 1089 | 162 | 1309 | 164 | 1343 |
| 20,000 | 135 | 980 | 145 | 1089 | 156 | 1309 | 158 | 1343 |

TABLE 4-67

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 143 | 815 | 155 | 938 | 172 | 1166 | 185 | 1346 |
| 14,000 | 143 | 847 | 152 | 938 | 170 | 1166 | 182 | 1346 |
| 16,000 | 142 | 882 | 148 | 938 | 165 | 1166 | 177 | 1346 |
| 18,000 | 141 | 928 | 142 | 938 | 159 | 1166 | 169 | 1346 |
| 20,000 | 141 | 1003 | 134 | 938 | 152 | 1166 | 160 | 1346 |

TABLE 4-68

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 6000 FT TEMPERATURE: -6 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 136 | 771 | 166 | 1171 | 174 | 1330 | 175 | 1340 |
| 14,000 | 135 | 804 | 162 | 1171 | 171 | 1330 | 171 | 1340 |
| 16,000 | 135 | 844 | 158 | 1171 | 166 | 1330 | 166 | 1340 |
| 18,000 | 134 | 887 | 154 | 1171 | 160 | 1330 | 161 | 1340 |
| 20,000 | 133 | 956 | 148 | 1171 | 154 | 1330 | 155 | 1340 |

TABLE 4-69

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 6000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 132 | 790 | 161 | 1304 | 161 | 1269 | 166 | 1340 |
| 14,000 | 132 | 815 | 161 | 1304 | 160 | 1269 | 162 | 1340 |
| 16,000 | 131 | 850 | 158 | 1304 | 156 | 1269 | 159 | 1340 |
| 18,000 | 128 | 882 | 154 | 1304 | 152 | 1269 | 155 | 1340 |
| 20,000 | 126 | 933 | 149 | 1304 | 147 | 1269 | 150 | 1340 |

TABLE 4-70

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 6000 FT TEMPERATURE: 16 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 140 | 774 | 160 | 1009 | 174 | 1216 | 181 | 1340 |
| 14,000 | 140 | 809 | 157 | 1009 | 170 | 1216 | 178 | 1340 |
| 16,000 | 138 | 840 | 153 | 1009 | 165 | 1216 | 172 | 1340 |
| 18,000 | 136 | 890 | 147 | 1009 | 158 | 1216 | 163 | 1340 |
| 20,000 | 135 | 972 | 139 | 1009 | 152 | 1216 | 156 | 1340 |

TABLE 4-71

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 6000 FT TEMPERATURE: 16 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 143 | 769 | 154 | 864 | 171 | 1078 | 190 | 1341 |
| 14,000 | 143 | 803 | 150 | 864 | 167 | 1078 | 186 | 1341 |
| 16,000 | 142 | 842 | 144 | 864 | 161 | 1078 | 178 | 1341 |
| 18,000 | 141 | 907 | 136 | 864 | 154 | 1078 | 167 | 1341 |
| 20,000 | 141 | 1005 | 118 | 864 | 147 | 1078 | 158 | 1341 |

TABLE 4-72

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 8000 FT TEMPERATURE: -25 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 132 | 738 | 162 | 1208 | 161 | 1179 | 169 | 1349 |
| 14,000 | 131 | 773 | 159 | 1208 | 158 | 1179 | 164 | 1349 |
| 16,000 | 128 | 801 | 155 | 1208 | 154 | 1179 | 160 | 1349 |
| 18,000 | 126 | 849 | 150 | 1208 | 149 | 1179 | 155 | 1349 |
| 20,000 | 124 | 919 | 144 | 1208 | 143 | 1179 | 149 | 1349 |

TABLE 4-73

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 8000 FT TEMPERATURE: -2 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 136 | 728 | 163 | 1084 | 173 | 1236 | 178 | 1343 |
| 14,000 | 135 | 765 | 160 | 1084 | 168 | 1236 | 174 | 1343 |
| 16,000 | 134 | 807 | 156 | 1084 | 162 | 1236 | 168 | 1343 |
| 18,000 | 133 | 863 | 149 | 1084 | 156 | 1236 | 160 | 1343 |
| 20,000 | 132 | 958 | 142 | 1084 | 149 | 1236 | 153 | 1343 |

TABLE 4-74

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 8000 FT TEMPERATURE: 15 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 140 | 733 | 159 | 930 | 172 | 1125 | 186 | 1341 |
| 14,000 | 139 | 767 | 155 | 930 | 168 | 1125 | 181 | 1341 |
| 16,000 | 136 | 805 | 149 | 930 | 161 | 1125 | 172 | 1341 |
| 18,000 | 135 | 876 | 141 | 930 | 153 | 1125 | 162 | 1341 |
| 20,000 | 134 | 980 | 129 | 930 | 146 | 1125 | 154 | 1341 |

TABLE 4-75

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 8000 FT TEMPERATURE: 16 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 143 | 728 | 151 | 795 | 169 | 993 | 195 | 1340 |
| 14,000 | 142 | 763 | 146 | 795 | 163 | 993 | 189 | 1340 |
| 16,000 | 141 | 815 | 139 | 795 | 156 | 993 | 176 | 1340 |
| 18,000 | 141 | 901 | 124 | 795 | 149 | 993 | 164 | 1340 |
| 20,000 | 135 | 1005 | 0 | 795 | 134 | 993 | 153 | 1340 |

TABLE 4-76

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 10000 FT TEMPERATURE: -35 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 132 | 699 | 161 | 1116 | 160 | 1095 | 172 | 1369 |
| 14,000 | 130 | 734 | 157 | 1116 | 156 | 1095 | 167 | 1369 |
| 16,000 | 127 | 769 | 152 | 1116 | 151 | 1095 | 161 | 1369 |
| 18,000 | 125 | 829 | 146 | 1116 | 145 | 1095 | 155 | 1369 |
| 20,000 | 123 | 930 | 138 | 1116 | 137 | 1095 | 148 | 1369 |

TABLE 4-77

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 10000 FT TEMPERATURE: -< C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 135 | 689 | 162 | 999 | 170 | 1141 | 182 | 1357 |
| 14,000 | 135 | 730 | 158 | 999 | 165 | 1141 | 176 | 1357 |
| 16,000 | 133 | 777 | 152 | 999 | 158 | 1141 | 168 | 1357 |
| 18,000 | 132 | 860 | 144 | 999 | 151 | 1141 | 159 | 1357 |
| 20,000 | 131 | 974 | 134 | 999 | 142 | 1141 | 151 | 1357 |

TABLE 4-78

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 10000 FT TEMPERATURE: 16 C

AIRCRAFT - UH-60A
BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 140 | 694 | 156 | 854 | 170 | 1039 | 190 | 1349 |
| 14,000 | 137 | 726 | 151 | 854 | 163 | 1039 | 183 | 1349 |
| 16,000 | 135 | 783 | 144 | 854 | 156 | 1039 | 170 | 1349 |
| 18,000 | 135 | 879 | 133 | 854 | 148 | 1039 | 160 | 1349 |
| 20,000 | 132 | 1028 | 108 | 854 | 134 | 1039 | 149 | 1349 |

TABLE 4-79

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 10000 FT TEMPERATURE: 36 C

AIRCRAFT - UH-60A BLACKHAWK

| GROSS WEIGHTS (LBS) | LONG RANGE | | MAX CONTINUOUS POWER | | MAX POWER (ENGINE) | | TRANSMISSION LIMITS | |
|---|---|---|---|---|---|---|---|---|
| | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HR) | VEL (KTS) | F.F. (LBS/HP) | VEL (KTS) | F.F. (LBS/HR) |
| 12,000 | 143 | 689 | 148 | 727 | 166 | 911 | 200 | 1344 |
| 14,000 | 141 | 729 | 141 | 727 | 159 | 911 | 189 | 1344 |
| 16,000 | 141 | 802 | 128 | 727 | 151 | 911 | 174 | 1344 |
| 18,000 | 138 | 907 | 0 | 727 | 139 | 911 | 160 | 1344 |
| 20,000 | 132 | 1048 | 0 | 727 | 110 | 911 | 149 | 1344 |

# APPENDIX A

## FUNCTIONS FOR CALCULATING BASIC FUEL FLOW

There are four functions that can be used to calculate the basic fuel flow for the UH-60A helicopter. In order to use the functions the following data is needed:

1. Flight Mode
2. Temperature
3. Pressure (altitude)
4. Gross weight

Which of the four functions will be used depends on the flight mode. The first function is for HIGE (Hover In Ground Effect).

$$FF\ (HIGE) = f\ (TEMP,\ ALT,\ GW)$$

The second function is for HOGE (Hover Out of Ground Effect).

$$FF\ (HOGE) = f\ (TEMP,\ ALT,\ GW)$$

The third function is for NOE (Nap of the Earth).

$$FF\ (NOE) = f\ (TEMP,\ ALT,\ GW)$$

The fourth function is for Forward Flight.

$$FF\ (Forward\ Flight) = f\ (AS,\ TEMP,\ ALT,\ GW)$$

The equation for FF (HIGE) is:

$$FF\ (HIGE) = A\ (ALT) + B\ (TEMP) + C\ (GW) + D\ (ALT)(TEMP) + E\ (ALT)\ (GW) + F\ (TEMP)\ (GW) + G\ (ALT)\ TEMP)\ (GW) + K$$

Where ALT is the altitude, TEMP is the temperature and GW is the gross weight and the constants have the following values:

$A = -2.36671245 \times 10^{-2}$ $\qquad$ $E = 1.14598178 \times 10^{-6}$

$B = 1.4961322 \times 10^{-1}$ $\qquad$ $F = 5.[illegible]0408472 \times 10^{-5}$

$C = 3.27971615 \times 10^{-2}$ $\qquad$ $G = 1.72859935 \times 10^{-9}$

$D = -2.76576072 \times 10^{-5}$ $\qquad$ $K = 2.77779198 \times 10^{2}$

The equation for FF (HOGE) is exactly the same form as FF (HIGE). A new set of values for the constants is used. These values are:

$A = -4.22082637 \times 10^{-2}$ $E = 2.85716479 \times 10^{-6}$

$B = -3.34395766 \times 10^{-2}$ $F = 8.61792723 \times 10^{-5}$

$C = 5.21710273 \times 10^{-2}$ $G = 4.73930817 \times 10^{-9}$

$D = -6.18146896 \times 10^{-5}$ $K = 1.62979187 \times 10^{2}$

The equation for FF (NOE) is once again the same as FF (HIGE). The new values for the constants are:

$A = -4.13708738 \times 10^{-2}$ $E = 2.58315822 \times 10^{-6}$

$B = 1.00027338 \times 10^{-1}$ $F = 6.16531179 \times 10^{-5}$

$C = 3.97294145 \times 10^{-2}$ $G = 1.76110437 \times 10^{-8}$

$D = -2.30705413 \times 10^{-4}$ $K = 2.49696922 \times 10^{2}$

For the Forward Flight modes the form of the equation is:

$$FF = A(AS) + B(AS^2) + C(AS^3) + D(TEMP) + E(GW) + F(ALT) + G(AS^3)(TEMP)$$
$$+ H(AS^2)(TEMP) + I(AS)(TEMP) + J(AS^3)(GW) + K(AS^2)(GW)$$
$$+ L(AS)(GW) + M(AS^3)(ALT) + N(AS^2)(ALT) + O(AS)(ALT) + P(TEMP)(GW)$$
$$+ Q(TEMP)(ALT) + R(GW)(ALT) + S(TEMP)(GW)(ALT) + T$$

Where AS is the air speed in kts and the values of the constants are:

$A = -1.75503817 \times 10^{0}$ $K = -3.2272938 \times 10^{-6}$

$B = 2.60824643 \times 10^{1}$ $L = -2.52148136 \times 10^{-4}$

$C = -9.75638628 \times 10^{-4}$ $M = 2.82405971 \times 10^{-8}$

$D = -5.36766827$ $N = -7.29170938 \times 10^{-6}$

$E = 3.93689685 \times 10^{-2}$ $O = 4.6046175 \times 10^{-4}$

$F = -5.07360115 \times 10^{-2}$ $P = 9.07814137 \times 10^{-6}$

$G = 8.74935993 \times 10^{-6}$ $Q = 1.92548687 \times 10^{-5}$

$H = -2.75745546 \times 10^{-3}$ $R = 2.29283282 \times 10^{-6}$

$I = 2.37587094 \times 10^{-1}$ $S = 1.13825678 \times 10^{-9}$

$J = 2.82843517 \times 10^{-8}$ $T = 7.30430611 \times 10^{2}$

These functions allow anyone with a simple calculator to figure the fuel flow of the aircraft and bypass both looking up the values and interpolating for points in between the data points in the tables.

The above equations calculate the basic fuel flow for the BLACKHAWK helicopter with the following accuracies:

FF (HIGE) - 99.51%

FF (HOGE) - 98.99%

FF (NOE) - 98.45%

FF (Forward Flight ) - 98.08%

# APPENDIX B

## FUNCTION FOR CALCULATING DELTA FUEL FLOW FOR DRAG

The function below will calculate the delta fuel flow for drag for the UH-60A helicopter. Recall from the discussion in chapter three that this value is added to the basic fuel flow value whenever drag is increasing the rate of fuel flow.*

In order to use the function the following data is needed:

1. Air Speed (AS)
2. Equivalent Square Footage of Drag (SQ)
3. Temperature (TEMP) in degrees centigrade
4. Altitude (ALT) in feet above sea level

That is:

$$FF\ (Drag) = f(AS, SQ, TEMP, ALT)$$

The equation for FF (Drag) is:

$$FF\ (Drag) = A(AS) + B(AS^2) + C(AS^3) + D(TEMP) + E(SQ) + F(ALT)$$
$$+ G(AS^3)(TEMP) + H(AS^2)(TEM) + I(AS)(TEMP) + J(AS^3)(SQ) + K(AS^2)(SQ)$$
$$+ L(AS)(SQ) + M(AS^3)(ALT) + N(AS^2)(ALT) + O(AS)(ALT) + P(TEMP)(SQ)$$
$$+ Q(TEMP)(ALT) + R(SQ)(ALT) + S(SQ)(ALT)(TEMP) + T$$

Where the constants have the following values:

| | |
|---|---|
| $A = -1.03805$ | $K = -4.74201969 \times 10^{-3}$ |
| $B = 1.52967332 \times 10^{-2}$ | $L = 3.49346161 \times 10^{-1}$ |
| $C = -5.13607656 \times 10^{-5}$ | $M = -1.98065486 \times 10^{-8}$ |
| $D = 5.11014169$ | $N = 3.76338545 \times 10^{-6}$ |
| $E = -6.55957258$ | $O = -2.77729705 \times 10^{-4}$ |
| $F = 1.45140886 \times 10^{-2}$ | $P = -4.76768687 \times 10^{-2}$ |
| $G = -9.29436328 \times 10^{-6}$ | $Q = -1.71242659 \times 10^{-5}$ |
| $H = 2.10173801 \times 10^{-3}$ | $R = -2.20640219 \times 10^{-4}$ |
| $I = -1.5564549 \times 10^{-1}$ | $S = 1.64278312 \times 10^{-6}$ |
| $J = 2.3078537 \times 10^{-5}$ | $T = -2.67658615 \times 10$ |

*There is no delta fuel flow for drag for HIGE, HOGE or NOE flight.*

This equation calculates the delta fuel flow for drag value with an accuracy of 99.33%. It should be noted that in some instances the computed value will be negative. If this occurs, zero (Ø) should be used as the value for de'ta fuel flow.

# APPENDIX C

## FUNCTION FOR CALCULATING GROUND IDLE FUEL FLOW

The function below will calculate the ground idle fuel flow rate for the UH-60A helicopter. In order to use the function the following data is needed:

1. Temperature (TEMP) in degrees centigrade.

2. Altitude (ALT) in feet above sea level.

That is:

$$FF\ (Idle) = f\ (TEMP, ALT)$$

The equation, for FF (Idle) is:

$$FF\ (Idle) = A(TEMP) + B(ALT) + C(TEMP)(ALT) + D(TEMP^2) + E(ALT^2) + F$$

Where the constants have the following values:

$A = -3.47589254 \times 10^{-1}$ $\quad$ $D = 4.68750088 \times 10^{-3}$

$B = -1.84255231 \times 10^{-2}$ $\quad$ $E = 1.36159557 \times 10^{-7}$

$C = 6.42851774 \times 10^{-7}$ $\quad$ $F = 5.53937698 \times 10^{2}$

This equation calculates the ground idle fuel flow rate with an accuracy of 99.85%

# APPENDIX D

## FUNCTIONS FOR CALCULATING GROSS WEIGHT LIMITS FOR TAKEOFF

The functions given below will calculate the gross weight limits for take off for the UH-60A helicopter. Each of the functions is of the same basic form with the values of the constants changing depending on which take off criteria is being used. In all cases the Structural Gross Weight Limit of the UH-60A helicopter is 20,250 lbs.

In order to use the functions the following data is needed:

1. Temperature (TEMP) in degrees centigrade

2. Altitude (ALT) in feet above sea level

That is:

GW (Limit) = f (TEMP, ALT)

The basic equation for GW (Limit) is:

GW (Limit) = A(TEMP) + B(ALT) + C(TEMP)(ALT) + D

For take off criteria #1 the equation must be used twice, once using the engine limit constants and once using the transmission limit constants. For take off criteria #1 the constants for engine limits are:

$A = -7.53214264 \times 10$ $\quad C = 1.84378553 \times 10^{-3}$

$B = -7.40458168 \times 10^{-1}$ $\quad D = 2.35560115 \times 10^{4}$

For take off criteria #1 the constants for transmission limits are:

$A = -2.17190464 \times 10$ $\quad C = 1.07642722 \times 10^{-4}$

$B = -2.20013201 \times 10^{-1}$ $\quad D = 2.17659282 \times 10^{4}$

For take off criteria #2 two checks must also be made. The constants for engine limits, take off criteria #2 are:

$A = -7.09054737 \times 10$ $\quad C = 1.73[illegible]843 \times 10^{-3}$

$B = -6.97222464 \times 10^{-1}$ $\quad D = 2.21[illegible]247 \times 10^{4}$

For take off criteria #2 the constants for transmission limits are:

$A = -2.0609287 \times 10$ $\quad C = 8.73573872 \times 10^{-5}$

$B = -2.09254643 \times 10^{-1}$ $\quad D = 2.12580105 \times 10^{4}$

Also for take off criteria #3 two checks must be made. The constants for engine limits, take off criteria #3 are:

$A = -9.96414289 \times 10$ $\quad C = 2.43828606 \times 10^{-3}$

$B = -9.80798528 \times 10^{-1}$ $\quad D = 3.12036589 \times 10^{4}$

For take off criteria #3 the constants for transmission limits are:

$A = -2.84426184 \times 10$ $\quad C = 1.02857094 \times 10^{-4}$

$B = -2.50585697 \times 10^{-1}$ $\quad D = 2.88286533 \times 10^{4}$

This equation with the various sets of constants gives results that are 95.13% accurate or better.

# APPENDIX E

## SHORT DESCRIPTION OF BLACKHAWK DATA SOURCE

DRDAV-EQA(A)
SUBJECT: Short Description of UH-60A BLACKHAWK Performance Data Provided to TRADOC Systems Analysis Activity (TRASANA)

MFR:

1. References:

a. UH-60A Utility Tactical Transport Aircraft System, Prime Item Development Specification, 1 Nov 76.

b. Determination of the Effects of Rotor Blade Compressibility on the Performance of the UH-1F; FTC-TR-65-17.

2. The performance data presented to TRASANA is the result of combining the helicopter power required, engine power available and engine fuel flow characteristics. The UH-60A power required was calculated for the required altitude and temperature combinations from a non-dimensional representation of engine power required (coefficient of power) v.s. gross weight (coefficient of thrust) and true airspeed (advance ratio). The non-dimensional engine power required was extracted from reference a. All performance in ground effect represents a 2 foot wheel height. A temperature dependent correction, based on the method outlined in reference b, was made to the power required to account for compressibility which could not be accounted for in the non-dimensional representation.

3. The T700-GE-700 engine power available (which was used in combination with the power required to find helicopter take off and speed limits), was calculated for the various altitude and temperature combination, by the use of the T700-GE-700 engine specification computer program.

4. The engine fuel flow at a particular altitude and temperature combination was derived from a representative referred fuel flow as a function of referred engine power. The referred fuel flow curve was constructed by use of the T700-GE-700 engine specification computer program which calculated fuel flows at various engine power levels and atmospheric conditions. The fuel flows were then corrected to reflect 5% conservatism. A referred parameter is one which is divided by temperature and pressure ratios in order to represent all atmospheric conditions by one function.

5. The never exceed speeds ($V_{ne}$) have not been formally established for the production UH-60A and are, therefore, not presented at this time.

/s/ JAMES A. O'MALLEY
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